THESIS

NEWELL, L.J.

1949

MEASUREMENT & EVALUATION of LEARNING + RETENTION AMONG THE MENTALLY RETARDED

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Thesis

MEASUREMENT AND EVALUATION OF LEARNING AND RETENTION AMONG THE MENTALLY RETARDED

Submitted by

Lawrence Joseph Newell

(B.S. in Ed., State Teachers College at Salem - 1942)

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

1949

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ACKNOWLEDGMENT

The author wishes to express his appreciation to Dr. Helen Blair Sullivan, Professor of Education, for her cooperation and guidance during the completion of this study.

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The author wishes to acknowledge his appreciation to the following administrators and teachers for their kind cooperation in this study.

Alicia T. Quealy	Principal	Oliver School, Lawrence
William O. Earle	Supervisor	of Special Services, Salem
Mary J. Cashman	Teacher	Kelly School, Newburyport
Frances Castaline	Teacher	Shurtleff School, Chelsea
Mary F. Clifford	Teacher	Oliver School, Lawrence
Marcia H. Crombie	Teacher	Warren Jr. High, West Newton
Etta Hoffman	Teacher	Williams School, Chelsea
Arax Kasian	Teacher	Oliver School, Lawrence
Harold Kennedy	Teacher	West School, Methuen
Gertrude McBreen	Teacher	Coharnet School, Taunton
Rebecca McKeon	Teacher	Ledge St. School, Worcester
Grace Morrison	Teacher	Training School, Beverly
Elinor Mulcahy	Teacher	Oliver School, Lawrence
Doris Philbrook	Teacher	Shurtleff School, Chelsea
Eleonora P. Preston	Teacher	T.R. Plympton School, Waltham
Catherine Redican	Teacher	Gaston School, S. Boston
Vera Rice	Teacher	Adams School, Everett
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CHAPTER I

THE PROBLEM

Statement of the problem. This study will involve the measurement and evaluation of the rate of learning in reading among children assigned to special classes for the mentally retarded. It will deal also with the determination of the status of retention on the basis of spaced practices conducted for four days after the initial learning.

Justification. Much work has been done on the learning rate, but the literature does not seem to yield any results that are based on studies dealing primarily with mentally retarded children.

The problem has implications of importance for the teaching of all of the language arts to the mentally retarded.

The mentally retarded seem to exhibit a most complex variety of reading confusions, some of which might be avoided if the material were presented on a definite basis, according to their ability to master it.

Available research is inconclusive, but suggests a low correlation between the rate of learning new words and intelligence.

Scope of study. The study will involve the children assigned to eighteen special classes for the mentally retarded, selected at random from the cities and towns of

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Massachusetts. Because of a wide divergence among the cities and towns of the basis for referral of children to special classes for the mentally retarded, the data collected will include figures on some youngsters who should more properly be termed slow learners, if the intelligence quotient were the primary criterion. The data collected will also include some figures on children whose intelligence quotient falls below 50, and are generally excluded from the regular classes for the mentally retarded. However, results will be reported only for the group having I.Q.'s of from 50 to 75.

Sex differences will be investigated.

A list of fifteen words will be chosen for introduction as sight words. After the initial learning, the same list of words will be used to measure the rate of learning. These words will then be used for spaced practices and used again to test the rate of retention.

In so far as is possible, the words chosen will be in the speaking vocabulary of the group tested, but will be at least two years above the highest reading age in the group.

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CHAPTER II

RESEARCH

In considering the problem of measuring and evaluating the learning rate among the mentally retarded, it occurred to the author that an examination of the literature from three separate approaches seemed expedient. The most appropriate points of view appear to be those concerned with previous research on the learning rate itself, the psychological aspects of the learning process, and the psychology of teaching reading to the mentally retarded.

THE LEARNING RATE

One of the most important factors influencing reading progress is the rate of learning new sight words.

After examining available studies, Seegers reports that context clues cannot be depended upon as the most efficient means of developing the reading vocabulary; it is better accomplished by building the stock of sight words.[1]

A significant contribution to the understanding and interpretation of the learning rate among primary school children has been made by Murphy, who defines the learning rate as the number of words a child can retain and identify

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as sight words one hour after the teaching period.[2]

One of the first questions that comes to mind concerning the learning rate is the level of correlation between this ability and intelligence. In studying age groups five through seven, Meek found that correlations between mental age and ability to learn new words in a situation for each age group were too small to be of any major significance. However, the older the group, the higher is the correlation.[3]

Murphy and Junkins found that the rate of learning to read is not perfectly correlated to intelligence, and that specific gains in the learning rate could be accomplished through specific auditory and visual training.[4]

Concerning the relationship between the learning rate and sex, Murphy found a statistically significant difference in the learning rate test scores in favor of the girls. Again this result applied specifically to children of the primary grades.[5]

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[2]Helen A. Murphy, "An Evaluation of the Effect of Specific Training in Auditory and Visual Discrimination on Beginning Reading," (Unpublished Ed. Doctor's Thesis, Boston University, School of Ed., 1943), p. 21.

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[4]Helen A. Murphy and K. Junkins, "Increasing the Rate of Learning in First Grade Reading," Education, Vol LXII, (September, 1941), pp. 37-39

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The work of Murphy, Meek and Arthur seems to the author to establish a progressive increase in the learning rate ability for the early formative years. This brings to mind the question as to whether or not this progression would continue beyond mental age 7.4. The literature is inconclusive on this point. In addition, the findings thus far enumerated resulted from measuring a population normal in intelligence. The writer wishes to raise the question as to whether or not similar results would be obtained from measuring a mentally retarded population.

The next question for examination concerns the psychology involved in teaching reading to the mentally retarded.

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TEACHING READING TO THE MENTALLY RETARDED

Here the author will not attempt to give complete coverage to the theory and method of teaching reading to the mentally retarded, but rather, an effort will be made to present some general statements specifically concerned with the development of sight vocabulary, or the learning rate, merely as a phase of the total reading picture.

Since the feeble minded child usually leaves school at chronological age sixteen, it is necessary for him to learn at as rapid a pace as possible, once he is ready to read, in order to reach his full potential while still in school. In this connection Hegge maintains that failure to respond readily to beginning reading instruction should indicate an immediate need for clinical reading procedures.[7]

Among the more effective clinical reading procedures employed by Hegge, a series of systematic word drills to build up the sight vocabulary was considered to be outstanding.[8]

As a result of extensive experimentation at the Wayne County Training School, Hegge found that a prolonged period

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of pre-academic training, until about chronological age eleven or twelve, gives the feeble minded child a level of maturity somewhat higher than ordinary for beginning reading activities, but it also provides the basis for a rate of progress which compares favorably to the rate of learning in the normal child.[9]

Baker reports on collecting opinions of five hundred teachers as to worthwhile practices in teaching the mentally retarded. Among the most frequently enumerated by the teachers were the following:

1. Drill by rote should find a large place in the teaching of dull pupils.

2. Drill is necessary for a proper fixation of bonds

3. A few words mastered to a fair degree of control will do more to establish the correct habits and proper attitudes toward reading than the skimming of an entire primer in a haphazard manner.[10]

Curtis maintains that memory for words and for the differences in sounds of words is fundamental to the development of facility in language.[11]

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[9] Ibid., p. 293.

[10] Harry J. Baker, Characteristic Differences in Bright and Dull Pupils, (Public School Publishing Company, Bloomington, Ill., 1927) p. 44.

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Speaking of the problem of improving the ability to read, Thorndike terms the vocabulary load the chief force opposing comprehension.[13]

Referring to vocabulary building, Featherstone remarks that it is of paramount importance to increase the sight vocabulary of the slow learner at a very slow pace, through many repetitions and experiences, in order to insure that every word will be his own for future use.[14]

That the mentally retarded pupil can be taught to read up to his mental level is a fact well substantiated through research. Gates and Pritchard studied a group of mentally retarded youngsters at the Speyer School and matched them as to mental age with a control group of normal youngsters. By means of superior teaching and an experience curriculum, they found that the mentally retarded children were somewhat superior in reading achievement to the control group. With

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[13] E.L. Thorndike, "Improving the Ability to Read," Teachers College Record, Vol XXXVI, (October - December 1934), p. 229.

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In a status study of the achievement of the special classes for the mentally retarded in Yonkers, New York, Bennett found reading ages closely approximating mental ages.[16] Since it is reasonable to assume that the mentally retarded child can be taught to read up to the level of his capacity, and that increasing the sight vocabulary is an effective means to accomplish that end, it seems that an examination of the learning process might cast some additional light on the problem.

PSYCHOLOGY OF LEARNING

About sixty years ago Hermann Ebbinghaus completed his monumental study on the human mind. Much of his treatise on memory remains valid today. He worked with himself as subject, memorizing certain sets of nonsense syllables and kept most careful records as to the rate of learning, the shape of

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[15] Arthur I. Gates and Miriam Pritchard, "Teaching Reading to Slow-Learning or Dull-Normal Pupils," Teachers College Record, Vol. XLIII, (January, 1942), p. 259.

[16] Annette Bennett, "Reading Ability in Special Classes," Journal of Ed. Research, Vol. XXI, (October, 1929) pp. 236-238.

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the curve of forgetting, distributed versus massed practices, retention and reproduction, the results of over-learning and many other factors.

Ebbinghaus describes the curve of forgetting as representing a loss of up to 50% of memorized material after the first day, but the loss becomes more gradual and there is scarcely any loss for the succeeding two weeks; as time goes on the amount of loss becomes fairly constant, so that it takes an indefinite amount of time to forget all of what has once been learned.[17]

Memory seems to be affected to a considerable degree by the kind and amount of practice applied to the original learning. Results of extensive research indicate that some form of distribution of practices is more effective than massing of practices, both as to the amount learned and the total time expended for learning.[18]

Ebbinghaus found that in committing series of nonsense syllables to memory, thirty-eight repetitions over a three day period were just as effective as sixty-eight repetitions in one day.[19]

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[17]Hermann Ebbinghaus, "Memory--A Contribution to Experimental Psychology,"(New York: Teachers College, Columbia University, 1913), p. 76.

[18]Edwin G. Boring, et.al., Foundations of Psychology, (New York: John Wiley & Sons, 1948)p. 156.

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Lois Meek conducted a study of retention in young children. She found that repetitions, after the second and third, contribute more than a little to the learning process, so far as sight words are concerned.[20]

The "once-per-day" method of learning gives far superior retention and is far more economical of time than the method of continuous practice. It is suited especially to material to be memorized by motor associations.[21]

Individual differences in learning seem to assume the same general pattern as they do for other criteria, such as physical characteristics, motor skills, etc. Age, intelligence and previous training seem to be the most important conditioners of learning. However, even when these three are controlled carefully, there is a wide divergence between the highest and lowest score in the controlled group.[22]

The curve of forgetting as described by Ebbinghaus, in which an individual forgets up to one half the material learned during the first hour after the learning and up to two-thirds is forgotten after the first day, is questioned by Gilleland, who concludes that this curve is true only for

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[20] Lois Meek, op. cit., p. 38.

[21] Darwin O. Lyon, "The Relation of Length of Material to Time Taken for Learning and the Optimum Distribution of Time," Part II. Journal of Ed. Psychology, Vol. V, (January, 1914), p. 91.

[22] E.G. Boring, et. al., op. cit., p. 154.

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[22] E.G. Boring, et. al., op. cit., p. 194.

nonsense material such as that used by Ebbinghaus. Gilleland experimented with the material contained in two educational films. His results with college students showed that 98% was retained after one week. Gilleland states that the type of material used is a most important determiner of the rate of forgetting.[23]

In a summary of available studies on memory, Reed concludes that meaning of the material used is a major factor in learning.[24]

Ebbinghaus feels that retention and reproduction are to a great degree dependent upon the interest and attention which were attached to the mental status the first time the stimuli were presented.[25]

Meek finds that the amount forgotten from one repetition to another, with children of the five and six year old group, is dependent upon the distribution of practice periods and the amount of practice involved.[26]

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[23] A.R. Gilleland, "Rate of Forgetting," Educational Psychology, Vol. XXXIX. (January, 1948), p. 22.

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[25] H. Ebbinghaus, op. cit., p. 3.

[26] Lois Meek, op. cit., p. 48.

nonsense material such as that used by Ebbinghaus. Gilleland experimented with the material combined in two educational films. His results with college students showed that 98% was retained after one week. Gilleland states that the type of material used is a most important determiner of the rate of forgetting.[23]

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Trow contends that the optimum length of interval between learning periods is indeterminate, depending upon the kind of task, motivation and other variables. Too short an interval introduces the uneconomical factors of massed practice. Too long an interval requires that a large portion of each succeeding practice be spent in getting back to the stage of proficiency attained during the preceeding one.[27]

Ebbinghaus describes for us his theory of over-learning when he states that a series of nonsense syllables repeatedly practiced after the initial learning show a very much higher percentage of material retained over a period of time than when the series is merely brought to the level of accurate repetition and left alone.[28]

There are many methods for testing the rate of learning. Dashiell describes the principles involved in the method to be used in the author's experiment. The degree to which a certain memorized kind of reaction has been retained up to a given time can be tested by the method of recognition. A series of stimuli, once presented for drill can be presented again at a given time to the same subject to determine how many of the series he can identify upon inspection. In the following case the stimulus

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[27]William Clark Trow, Introduction to Educational Psychology, (Boston: Houghton Mifflin Company, 1937), p. 235.

[28]Hermann Ebbinghaus, op. cit., p. 176.

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is the flashed word, with visual analysis in all probability being dominant, rather than association with some external stimuli.[29]

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[29] John F. Dashiell, Fundamentals of Objective Psychology (Boston: Houghton-Mifflin Company, 1937), pp. 376-377.

CHAPTER III

PROCEDURE

This experiment is an attempt to measure and evaluate the rate of learning to read new words, and the status of retention on the part of the mentally retarded.

Teaching materials. A series of fifteen words were chosen and printed commercially on pieces of tag, 2½ inches by 9 inches, this size being considered convenient for use as flash cards with small groups. A commercial type face most closely approximating manuscript printing characters was used. A set of these flash cards was used by each teacher conducting the experiment.

Choice of words. The words used in the experiment were taken from the enrichment list for the sixth grade from the Durrell-Sullivan Remedial Vocabulary List. The sixth grade list was chosen because it was hoped that this grade would be at least two grades above the reading level of the vast majority of the children to be tested. Such was the case in all instances reported in the analyzed data. The words chosen were all colorful words, rich in meaning, and hence more easily learned and retained by the dull.

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Plan of experiment. The plan of the experiment was divided into three main areas: the pretest, the introduction

of the words with the accompanying learning rate test, and the spaced practices with the determination of the rate of retention to follow.

The pretest consisted of flashing each card to every pupil individually to determine how many of the chosen words were already in his reading vocabulary. This enabled the author to screen out from the reported data the figures for any child who had a pretest score of five or more words known at the beginning of the experiment.

The words were introduced to the pupils as sight words according to specific directions furnished to the teacher by the author. The following is a sample of the directions to the teacher:

1. Teacher holds up the first card before the pupils in the group, saying, "This says 'halo'". "What does it say?". The children repeat the word in unison.
2. Teacher prints the word on the board.
3. Teacher matches flash card to the printed word on the board as children again respond to the teacher's question, "What does it say?".
4. Teacher then enriches the meaning of the word through discussion, encouraging comment by the pupils.
5. Teacher then calls attention of the pupils to the general configuration of the word, such as the

of the words with the accompanying learning rate test, and the spaced practices with the determination of the rate of retention to follow.

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The words were introduced to the pupils as eight words according to specific directions furnished to the teacher by the author. The following is a sample of the directions to the teacher:

1. Teacher holds up the first card before the pupils in the group, saying, "This says 'halo'. What does it say?". The children repeat the word in unison.
2. Teacher prints the word on the board.
3. Teacher matches flash card to the printed word on the board as children again respond to the teacher's question, "What does it say?".
4. Teacher then emphasizes the meaning of the word through discussion, encouraging comment by the pupils.
5. Teacher then calls attention of the pupils to the general configuration of the word, such as the

beginning and ending letters, double letters, blends, etc.

6. Some children are chosen by the teacher to match the flash card to the printed word on the board.

7. Children all repeat word in unison as card is flashed again before going on to introduce the next word.

8. As each new word is introduced review the ones previously taught by having pupils match cards to the printed words on the board, calling out the word as they match it.

9. If any child does not know what a card says in this review work, he is told what it says by the teacher and must repeat the word as he matches it.

10. When all fifteen words have been introduced the teacher tells the children they may erase from the board any word they may know; the various children called upon erase a word calling it out as they do so.

11. Next the teacher deals out all the flash cards to the pupils and says, "Give me 'halo', give me 'waffle'" etc., the children having these cards return them to the teacher as they are called for.

12. Again, if any child does not know what his card says he is told immediately and repeats what it says while looking at it before returning it to the teacher.

13. The teacher again deals out the cards to the pupils

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10. When all fifteen words have been introduced the teacher tells the children they may erase from the board any word they may know; the various children called upon erase a word calling it out as they do so.

11. Next the teacher deals out all the flash cards to the pupils and says, "Give me 'half', give me 'waffle'" etc., the children having these cards return them to the teacher as they are called for.

12. Again, if any child does not know what his card says he is told immediately and repeats what it says while looking at it before returning it to the teacher.

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and the pupils return them, saying them as they do, without the teacher calling for any particular word.

The learning rate test was administered one hour after the conclusion of the introduction of the words. It was administered to each pupil individually, by flashing each card for a period of approximately one second. The score, which is the number of words correctly identified, was entered in the appropriate column on the data sheet.

The spaced learning was conducted at the beginning of the day for the next four school days, for a period of about twenty minutes. The words were flashed through twice by the teacher, while the children called them out in unison.

On the afternoon of the fifth day after the initial test, the children were again tested individually by the teacher who flashed each word for a period of approximately one second. The score, which is the number of words correctly identified by each child, was taken to be the retention rate and was entered in the appropriate column on the data sheet.

Classes used. Requests were sent out to eighteen classes in the cities and towns of Massachusetts, chosen at random. Data was reported from all eighteen. Some of the figures on certain pupils were not included in the analysis of the data due to absences during the experiment or to obtaining a high score on the pretest.

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On the afternoon of the fifth day after the initial test, the children were again tested individually by the teacher who flashed each word for a period of approximately one second. The score, which is the number of words correctly identified by each child, was taken to be the retention rate and was entered in the appropriate column on the data sheet.

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Data sheet. In addition to a set of specific directions for conducting the experiment, each teacher received a data sheet for recording the results obtained. This sheet provided spaces calling for the following information on each participating pupil:

1. Name of pupil, first name and last initial.
2. Chronological age in years and months.
3. Binet I.Q.
4. I.Q. other, if no Binet available.
5. Mental Age.
6. Sex, M or F.
7. Pretest score.
8. Learning Rate score.
9. Retention Rate score.
10. Reading Grade, teacher estimate.
11. Absence during experiment, number of days.
12. Name and school address of examiner.

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TABLE I

CORRELATION OF INTELLIGENCE AND LEARNING RATE

No. of Cases	Mean	Standard Deviation	Correlation
119	I.Q. 62	4.76	.25
	N. of words 8	6.57	

Table I presents 119 cases having a mean intelligence quotient of 62 and a mean learning rate score of 8 words. The low correlation of .25 between the two measures signifies that intelligence is not a significant determiner of the number of words a child can learn in a given time.

TABLE I

CORRELATION OF INTELLIGENCE AND LEARNING RATE

No. of Cases	Mean	Standard Deviation	Correlation
	I.Q.		
119	82	4.78	.25
	No. of words		
	8	6.57	

Table I presents 119 cases having a mean intelligence quotient of 82 and a mean learning rate score of 8 words. The low correlation of .25 between the two measures signifies that intelligence is not a significant determiner of the number of words a child can learn in a given time.

TABLE II

CORRELATION OF INTELLIGENCE AND RETENTION

No. of Cases	Mean	Standard Deviation	Correlation
115	I.Q. 63	5.91	.44
	N. of Words 8	5.38	

Table II shows the correlation of .44 between intelligence and retention for 115 cases with a mean intelligence quotient of 63, and a mean retention rate score of 8 words. It would appear that the intelligence quotient in itself is not a significant factor influencing the ability to retain sight words.

TABLE II

CORRELATION OF INTELLIGENCE AND RETENTION

No. of Cases	Mean	Standard Deviation	Correlation
115	83	5.91	.44
	8	5.30	

Table II shows the correlation of .44 between intelligence and retention for 115 cases with a mean intelligence quotient of 83, and a mean retention rate score of 8 words. It would appear that the intelligence quotient in itself is not a significant factor influencing the ability to retain eight words.

TABLE III

CORRELATION OF MENTAL AGE AND LEARNING RATE

No. of Cases	Mean	Standard Deviation	Correlation
106	M.A. 7/10	3.79	.67
	N. of Words 7	4.99	

Table III shows that with 106 cases having a mean mental age of 7 years and 10 months and a mean learning rate of 7 words there exists a correlation of .67 between the measures. In more than half of the cases tested the learning rate score was directly related to the mental age of the subject being tested.

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TABLE IV

CORRELATION OF MENTAL AGE AND RETENTION

No. of Cases	Mean	Standard Deviation	Correlation
105	M.A. 7/10	3.68	.74
	N. of Words 7	5.07	

Table IV shows that in 105 cases with a mean mental age of 7 years and 10 months and a mean retention rate score of 7 words there appeared a correlation of .74. There seems to be a fairly high relationship between the amount of words retained and mental age. The distribution on which the above table was based had a preponderance of cases in the upper mental age range. It can be fairly assumed that the relationship would have been even higher had there been a fair share of data available on the lower end of the mental age range.

TABLE IV

CORRELATION OF MENTAL AGE AND RETENTION

No. of Cases	Mean	Standard Deviation	Correlation
105	7\10	5.58	.74
	7	5.07	

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TABLE V

CORRELATION OF CHRONOLOGICAL AGE AND LEARNING RATE

No. of Cases	Mean	Standard Deviation	Correlation
109	C.A. 12/1	3.8	.43
	N. of Words 8	4.8	

Table V shows a low relationship between the number of words identified one hour after the teaching period and the chronological age of the subjects tested.

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No. of Cases	Mean	Standard Deviation	Correlation
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TABLE VI

CORRELATION OF CHRONOLOGICAL AGE AND RETENTION

No. of Cases	Mean	Standard Deviation	Correlation
107	C.A. 11/6	3.7	.90
	N. of Words 10	5.4	

Table VI shows a correlation of .90 between chronological age and retention rate for 107 cases with a mean chronological age of 11 years and 6 months and a mean retention rate score of 10 words. It would seem that chronological age is a highly significant factor influencing the ability to retain new sight words after a specific number of spaced practices.

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No. of Cases	Mean	Standard Deviation	Correlation
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TABLE VII

CORRELATION OF LEARNING RATE AND RETENTION

No. of Cases	Mean	Standard Deviation	Correlation
112	7	4.9	.80
	9	5.8	

Table VII represents 112 cases with a mean learning rate score of 7 words and a mean retention rate score of 9 words. The correlation of .80 shows that a high order or relationship exists between the ability to learn new sight words and the ability to retain them on the basis of four spaced practices.

TABLE VII

CORRELATION OF LEARNING RATE AND RETENTION

No. of Cases	Mean		Standard Deviation		Correlation
112	7	9	4.9	5.9	.80

Table VII represents 112 cases with a mean learning rate score of 7 words and a mean retention rate score of 9 words. The correlation of .80 shows that a high order of relationship exists between the ability to learn new sight words and the ability to retain them on the basis of four spaced practices.

TABLE VIII

CORRELATION OF RETENTION RATE WITH READING GRADE

No. of Cases	Mean	Standard Deviation	Correlation
	Reading Grade		
111	2.5	1.74	.75
	N. of Words		
	7	5.3	

Table VIII shows that in 111 cases reported on, with a mean reading grade of 2.5 plus or minus 1.74 reading grades and a mean retention rate score of 7 words plus or minus 5.3 words, there was a correlation of .75. The higher the reading grade, the higher w as the retention rate score. In a preponderance of cases those who demonstrated the ability to learn and retain 15 words were the better achievers in reading.

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TABLE IX

COMPARISON OF MENTAL AGE AND RETENTION

Mental Age Range	No.	Mean Number of Words	SEm	Diff. M_1-M_2	SE (Diff)	C.R.
6/4 to 8/4	35	9.71	.767			
8/5 to 10/6	56	12.64	.48	2.93	.137	3.387

Table IX shows the mean retention rate scores for two mental age groups. The group having a mental age range from 6 years and 4 months to 8 years and 4 months had a mean retention rate of 9.71 words. The group with mental age range from 8 years and five months to 10 years and 6 months was able to retain a mean of 12.64 words after four periods of spaced practice. The critical ratio of 3.387 is statistically significant.

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TABLE X

COMPARISON OF SEX AND LEARNING RATE

Sex	No.	Mean Number of Words	SE_m	Diff M_1-M_2	SE (Diff)	C.R.
M	79	6.78	.56	.44	.18	2.44
F	27	6.34	.84			

Table X shows that the 79 boys tested had a mean learning rate score of 6.78 words. The 27 girls tested had a mean learning rate score of 6.34 words. The critical ratio of 2.44 shows a statistically, significant difference in favor of the boys.

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COMPARISON OF SEX AND RETENTION

Sex	No.	Mean Number of Words	SE_m	Diff M_1-M_2	SE (Diff)	C.R.
M	79	10.2	.56	.3	.213	1.41
F	27	9.9	1.04			

Table XI shows that the 79 boys tested had a mean retention rate score of 10.2 words. The 27 girls tested had a mean retention rate score of 9.9 words. The critical ratio of 1.41 points to a statistically significant difference in favor of the boys.

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COMPARISON OF SEX AND RETENTION

Sex	No.	Mean	SE_m	Diff M_1-M_2	SE (Diff)	C.R.
M	79	10.2	.86	.5	.212	1.41
F	27	9.9	1.04			

Table XI shows that the 79 boys tested had a mean retention rate score of 10.2 words. The 27 girls tested had a mean retention rate score of 9.9 words. The critical ratio of 1.41 points to a statistically significant difference in favor of the boys.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary. The problem presented is an attempt to measure and evaluate the rate of learning in reading and the ability in retention among children assigned to special classes for the mentally retarded.

The study involved the children assigned to eighteen special classes for the mentally retarded, selected at random from the cities and town of Massachusetts. Because the number of children assigned to these classes would include some rather high in intelligence and some so low in intelligence as to exclude them ordinarily from school, it was decided to report only on those within the intelligence quotient range from 50 to 75.

A list of fifteen words was chosen for introduction as sight words. After the initial learning, the same list of words was used to measure the rate of learning. The same list was used again for spaced practices and to test the rate of retention.

Conclusions. The following is a listing of the major outcomes of the study.

1. It would seem that chronological age is a highly significant factor influencing the ability to retain new sight words after a specific number of practices, yielding a

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Conclusions. The following is a listing of the major outcomes of the study.

1. It would seem that chronological age is a highly significant factor influencing the ability to retain new sight words after a specific number of practices, yielding a

correlation of .90.

2. A lower relationship appears between chronological age and the number of words identified one hour after the initial learning period, being a correlation of .43.

3. The higher the reading grade the higher was the retention rate score, with a total correlation of .75.

4. There seems to be a fairly high relationship between the number of words retained and mental age. These two factors had a correlation coefficient of .74.

5. A lower but significant relationship between mental age and learning rate apparently exists, being .67.

6. It would appear that the intelligence quotient in itself is not a significant factor influencing the ability to retain sight words, the correlation being .44.

7. It would appear that the intelligence quotient is not a specific determiner of the number of new words a child can learn in a given time, the relationship between the two being .25.

8. For the mental ages tested there seems to be a pattern in the number of words retained, with an increase in retention accompanying an increase in mental age. However, the increase does not seem directly proportional.

9. The correlation coefficient of .80 indicates that a high order of relationship exists between the ability to learn new sight words and the ability to retain them on the basis of four spaced practices.

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2. A lower relationship appears between chronological age and the number of words identified one hour after the initial learning period, being a correlation of .43.

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8. For the mental ages tested there seems to be a pattern in the number of words retained, with an increase in retention accompanying an increase in mental age. However, the increase does not seem directly proportional.

9. The correlation coefficient of .60 indicates that a high order of relationship exists between the ability to learn new sight words and the ability to retain them on the basis of four spaced practices.

10. There seems to be a statistically significant difference in learning rate in favor of the boys.

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CHAPTER VI

SUGGESTIONS FOR FURTHER RESEARCH AND LIMITATIONS OF THE STUDY

Suggestions for Further Research

1. Repeat the experiment with a larger number of children, having a more even distribution of mental ages and intelligence quotients.

2. Repeat the study but in the introduction of the words emphasize the meaning; then test the children not only for the number of words learned but for the quality of the meaning retained. Such a study would be based on the possible assumption that the speaking vocabulary is of primary importance to the mentally retarded.

3. Establish more definitely the limits of learning and retention rates for the various mental age ranges by carefully selecting the population tested so as to include corresponding numbers of cases at each mental age range.

4. Repeat the study on a group several times over, having a control group that does not receive drill on specific lists of words in order to measure the amount of growth in reading.

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4. Repeat the study on a group several times over, having a control group that does not receive drill on specific lists of words in order to measure the amount of growth in reading.

Limitations of the Study

1. The study measures only learning and retention. It makes no provision for the analysis of the actual transference of these skills to the reading process.

2. Active participation on the part of the subject is basic to learning. This factor of motivation was not well controlled in the experiment.

3. Since the experiment was conducted by different teachers it is impossible to determine to what extent differing interpretations of the directions might have influenced the results.

4. All scores should have been reduced to standard scores to facilitate the finding of critical ratios in order to establish in all cases the level of significance with which the results were presented.

5. The random selection of classes left the results weighted in favor of the intermediate class group, with few cases falling in the primary grade group. There is a possibility that this factor skewed the results.

6. Random selection of classes also resulted in a great majority of males tested.

7. Reading achievement was based on teacher estimate, rather than by standardized test.

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APPENDIX

THE BOWDITCH SCHOOL
Flint St.
Salem, Mass.

Dear Colleague:

In partial fulfilment of the requirements for the degree of Master of Education at Boston University, I have undertaken an experimental study to be conducted in a representative group of special classes for the mentally retarded.

The experiment will involve the measurement and evaluation of the rate of learning in reading, and the effect of spaced practices on retention.

It is hoped that the results of the study will point to definite implications for classroom procedure.

The author earnestly requests your aid in carrying this experiment to a successful conclusion.

The accompanying envelope contains detailed instructions. Only the class record sheet need be returned to the author, and a stamped, addressed envelope is provided for that purpose.

Thanking you for your consideration and invaluable help in conducting this experiment, I remain

Sincerely yours,

Lawrence J. Newell

Lawrence J. Newell

DIRECTIONS TO TEACHERS

This experiment is an attempt to measure and evaluate the rate of learning to read new words on the part of mentally retarded youngsters. It is desirable, in so far as is practicable, to follow the directions as outlined below.

I. Pretest

A. Flash each card for approximately one second and record the total number of words known by each child on the accompanying record sheet.

B. The pretest must be given individually to each child, in a corner of the room out of the sight and hearing of those not yet tested.

II. Introduction of words to groups

A. Utilize the reading groups that you work with regularly.

B. Introduce the words as sight words

1. teacher holds up first card saying, "This says 'halo'". "What does it say?" Children repeat word in unison.
2. teacher prints word on the board.
3. teacher matches flash card to the printed word on the board as children again respond to teacher's question "What does this say?"
4. teacher then enriches the meaning of the word through discussion, encouraging comment from the pupils.
5. teacher then calls attention of the pupils to the general configuration of the word, such as beginning and ending letters etc.
6. certain children are chosen by the teacher to match the flash card to the word on the board.
7. after each new word is introduced, review the words previously taught by having pupils match cards to the words on the board.
8. if any child does not know what a card says he is told by the teacher.
9. when all fifteen words have been introduced, the teacher tells the children they may erase from the board any word they may know; the various children erase aword calling it out as they do so.
10. teacher then flashes all the cards and the pupils call them out in unison.
11. next the teacher deals out all the cards to the pupils and says, " Give me 'halo', give me '~~fusillage~~ fuselage'" etc. the children having these cards return them to the teacher as they are called for. If any child does not know his word he is told what it says.
12. teacher again deals out cards to pupils; any child may return to the teacher the words he knows, calling them out as he returns them. If any child does not know a word he is told what it says.

III. Test for learning rate

A. At the expiration of one hour after the conclusion of the introduction of the words the children are tested individually in a secluded corner of the room.

B. Words are flashed one at a time for a period of one second, and the score which is the number of words recognized is recorded in the appropriate column on the accompanying record sheet.

IV. Spaced learning

A. At the beginning of the day for the next succeeding four school days the words are flashed through twice for each group while the children call them out in unison.

V. Test of retention

A. On the afternoon of the fifth day after the initial test, the children are again tested individually and the number of words retained is recorded for each child.

B. The retention rate test is administered in the same manner as the test for learning rate under III, B.

VI. Time allotment

A. It is suggested that the pretest, introduction of words and the learning rate test be conducted on Monday; the spaced practices on Tuesday, Wednesday, Thursday and Friday mornings and the retention rate test on Friday afternoon.

B. The experiment will average no more than thirty minutes per day for one week.

CLASS RECORD SHEET

1	2	3	4	5	6	7	8	9	10	11	12
Name of pupil (first name and last name initial)	Chronological Age years and months	I.Q. (Binet)	I.Q. (other)	Mental Age	Sex (M or F)	Pretest Score	Learning Rate	Retention Rate	Reading Grade (teacher estimate)	Absence, during experiment number of days	Name of examiner school address

waffle

Allen

meteor

UNIVERSITY OF CALIFORNIA

tackle

signature

tapestry

jonquil

harpoon

lens

prostrate

tank

scaffold

yolk

halo

brooch

fuselage

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